NORTHROP

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9th May 2014

South Village Pty Ltd
Level 37, Chifley Tower
2 Chifley Square
Sydney NSW 2000

c/- email: *Ionic Management (Development Manager - Adrian Kilburn)*

akilburn@imanage.net.au

Dear Adrian,

RE: MP 10_0076 S75W (MOD 3) – Mixed-use Development [Kirrawee (South Village)]

Compensatory Habitat Water Body - Water Supply and Water Quality

We refer to the proposed mixed-use development at 566-594 Princes Highway, Kirrawee – otherwise known as Kirrawee (South Village). This statement has been prepared to support the Application for Modification of the Concept Plan [Reference MP 10_0076 S75W (MOD 3)]. It describes the concepts for water supply and general management of water quality for the compensatory habitat water body.

General

1. A harvested rainfall runoff system is proposed to supply water to the compensatory habitat water body.

2. The system will constitute harvesting and recycling treated rainfall runoff from the public park area.

Treatment of the Rainfall Runoff Being Harvested

3. The surface runoff will be treated prior to collection within a rainwater storage facility.

4. Bio-retention treatment measures will be used to treat flows from the public park surface via wetland planting to the perimeter of the pond.

5. Northrop has undertaken preliminary calculations to approximate the bio-retention treatment areas required for treating runoff from the public park surface as approximately 260m^2.

   These initial results achieve at least the 90th %-ile water quality requirements outlined in the Equatica Report (August 2011) - for treating TSS, TP and TN in runoff prior to discharging to the pond.

Maintaining 'Pond' Water Quality

Water quality is proposed to be maintained in the pond by re-circulating 'in-pond' water through constructed wetlands. This presents a number of advantages to improve water quality:

- It is a natural method for controlling and improving water quality.

- Wetlands are used in numerous development and infrastructure projects to control water quality – and are well understood.
- It is a low energy solution. It is anticipated a circa 1L/s pump will be required (which uses less than 1000kW / year).
- The wetland can be integrated into the landscape and contribute to habitat and runoff water quality objectives.
- This system requires low maintenance – particularly when compared to recirculation devices, infiltration systems, etc.

Key preliminary design features for the wetland recirculation system include:

- Fully vegetated wetland with no open water – and no more than 0.5m deep. Initial calculations indicate an effective area of 800m^2 will be required (i.e. 400m^3 volume).
- A layout that precludes water short circuiting through the wetland cell.

Harvested Rainwater Storage and Supply to the Water Bodies

6. The rainwater storage facility is proposed to be located within the public park area.
7. A dedicated storage facility will provide connection for recycled rainwater supply to the compensatory habitat water body. This will enable discrete supply / metering (separate to the development).
8. Northrop has undertaken preliminary water balance calculations to estimate the volume for the rainwater storage facility. The results indicate a maximum storage size of 400m^3 would maintain water supply for supplementing the compensatory habitat water body (based on achieving 80% of water supply from harvested runoff) – subject to detailed analysis.

   The preliminary water balance calculations were based on the following:

   - 34-year historical record of evaporation and rainfall data – from Sydney Airport.
   - Approx. 8,500m^2 catchment area (as described above)
   - Accounting for initial and on-going losses to the paved, grassed and vegetated surfaces.
   - Total surface area of approx. 800m^2 for both the water body. This translates to approx. 1,200m^3 volume (at 1.5m average depth) for the compensatory habitat water body.
   - No seepage losses – by using impermeable liners to water bodies.
9. Notwithstanding the calculations outlined in 8. (above), provisions for mains water supply back-up will be implemented – to address any potential shortcoming in rainfall. However, given the scale of the compensatory water body particularly, it is recommended mains water use should be monitored closely to ensure it is kept to a minimum. For example, water trucks might be considered to manage / maintain critical water levels during drought conditions, in lieu of freely accessing mains water (if / when required).
10. It is anticipated the water body will operate independently of the development. This will provide delineation of ownership (between 'public' and 'private').
11. Water being stored within the rainwater storage tank may require re-circulation / aeration and water quality monitoring and testing plans to promote its on-going integrity and avoid issues of

deterioration (due to stagnation). This is subject to detailed analysis of the treatment and supply processes.

Pond Water Being Discharged from the Site

12. The Compensatory Habitat Water Body will be subject to overflow.

13. An overflow pit with drainage pipe is proposed to convey these flows.

14. The overflow pit will incorporate a trash screen to trap debris being conveyed within the overflow runoff.

15. Sediments and nutrients within rainfall runoff (and any overflow water) will be treated by (a) the constructed wetland planting provided for recirculating pond water to maintain its integrity, (b) the pond (in general), and (c) all water delivered to the pond being already treated.

16. The overflow runoff will discharge to the rainwater harvesting tank.

17. The rainwater harvesting tank will overflow to an on-site stormwater detention (OSD) system being constructed for the excess public park runoff. The OSD system will be designed to accommodate the Public Park / overflow – in order to achieve acceptable rates for the public park portion of stormwater discharge from the site.

Schematics (attached)

18. Schematic Water Management Diagram –Public Park and Water Body

19. Typical Edge Treatment – Compensatory Habitat Water Body

20. Typical Overflow Treatment – Compensatory Habitat Water Body

We trust this is sufficient to support Approval.

Yours faithfully,

NORTHROP

Mathew Richards

Principal - Civil Engineer

CONSTRUCTED WETLAND CELL / SWALE TREATS RUNOFF + RECIRCULATED POND WATER (350 M2)

RECIRCULATING (SUBMERSIBLE) PUMP

TOP-UP FROM COLLECTION TANK

CONSTRUCTED WETLAND CELL / EDGE VEGETATION TREATS RUNOFF + RECIRCULATED POND WATER. (450 M2)

OVERFLOW PIT W/ TRASH SCREEN TO TREAT DEBRIS. DISCHARGES TO COLLECTION TANK VIA POLLUTION CONTROL DEVICE

O.S.D TANK TO CONTROL PARK DISCHARGE IN EXTREME EVENTS - WHEN COLLECTION TANK OVERFLOWS

RECIRCULATION PIPE to CONVEY 1 L/S FLOW to UPSTREAM END OF WETLAND

MAINS WATER TOP-UP

EXCESS PARK RUNOFF DISCHARGES TO NEW STREET DRAINAGE SYSTEM IN FLORA STREET

NORTHROP Bringing people, ideas & engineering together
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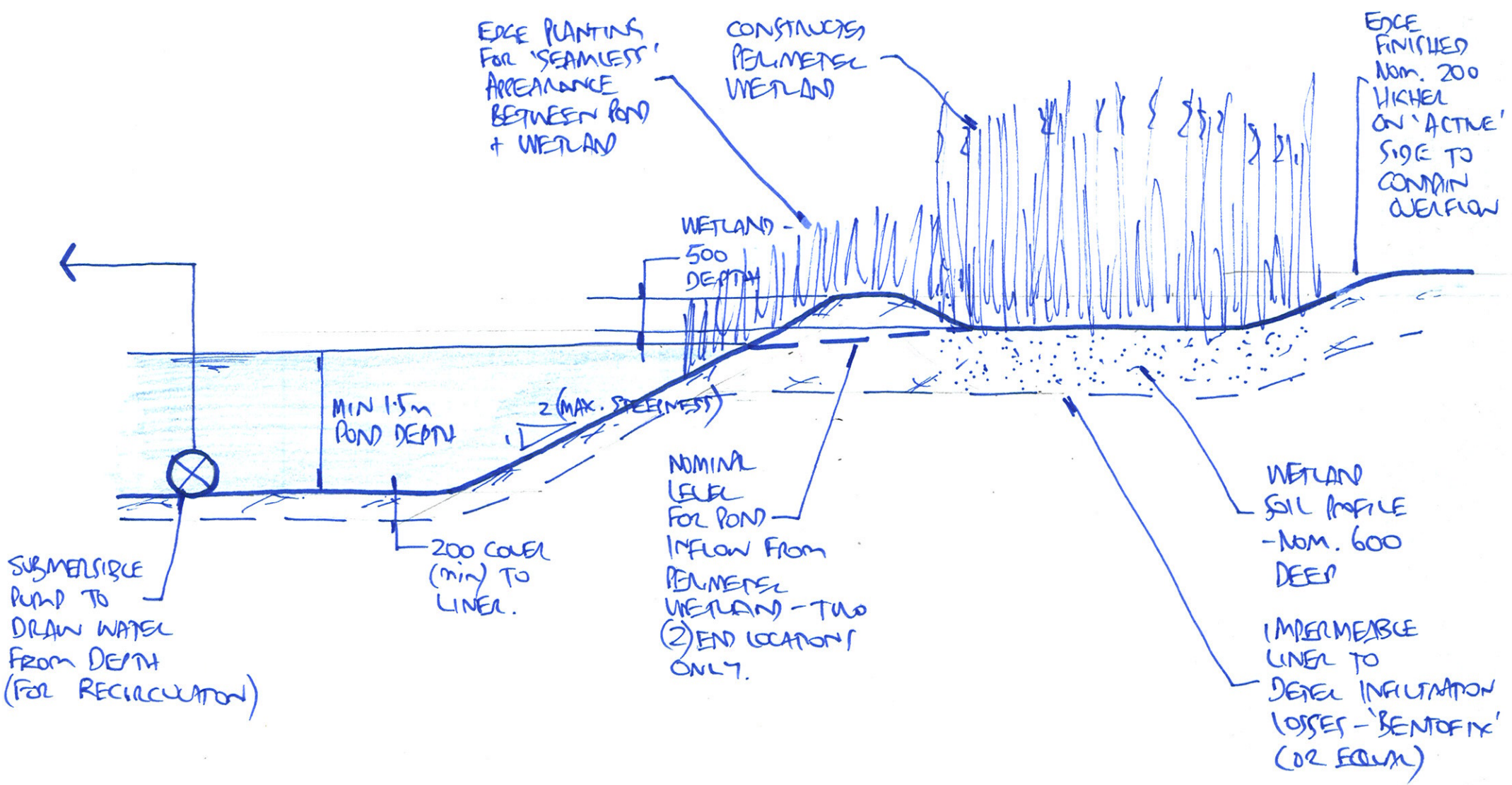
PRELIMINARY

KIRRAWEE (SOUTH VILLAGE)
SCHEMATIC WATER MANAGEMENT DIAGRAM - PUBLIC PARK + WATER BODY
130603 NTS 06.05.14.



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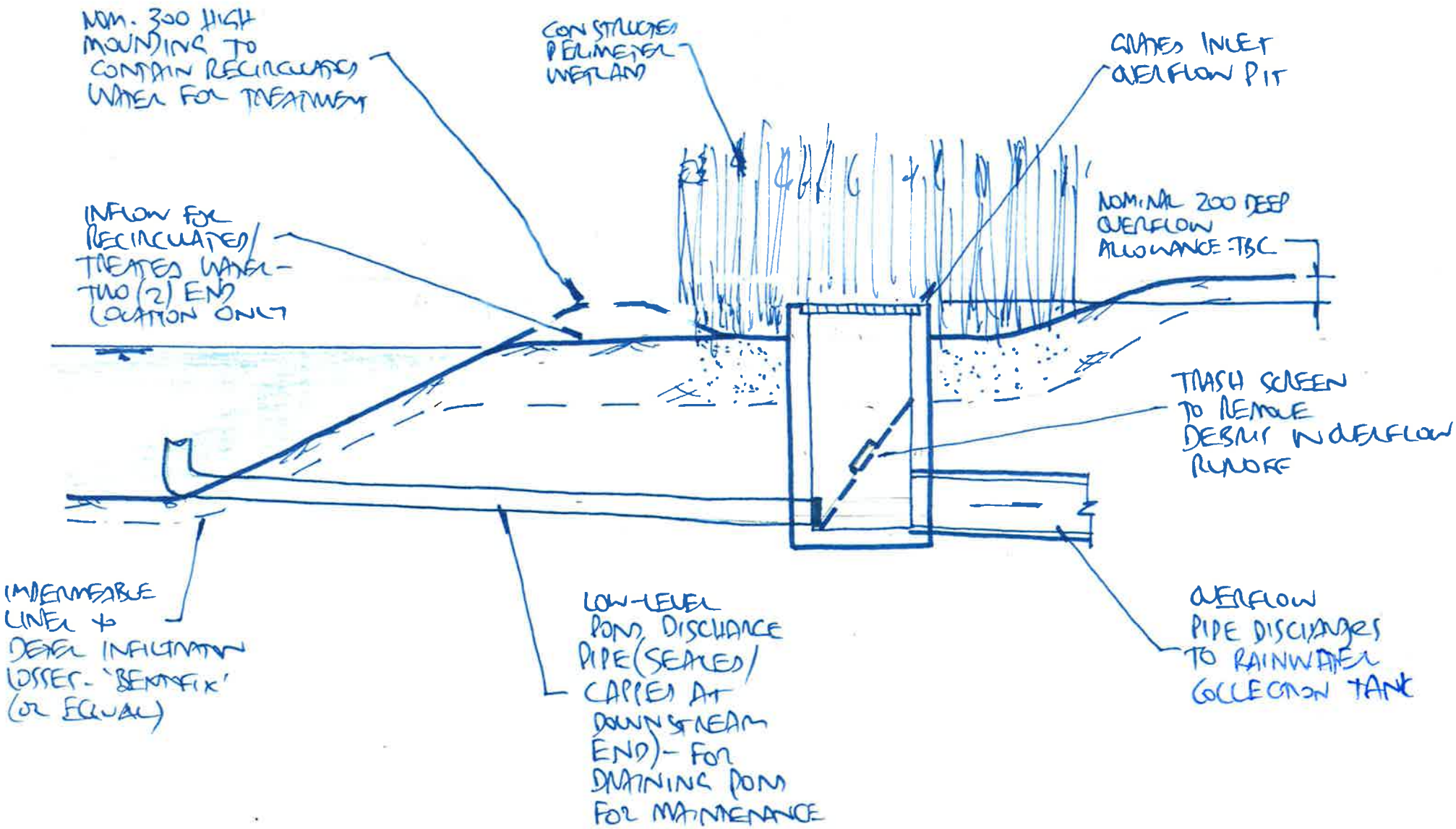
KIRRAWEE BRICK PIT
TYPICAL EDGE TREATMENT
COMPENSATORY HABITAT WATER BODY

1064, NTS 14.09.11



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KIRRAWEE BRICK PIT

TYPICAL OVERFLOW TREATMENT

COMPENSATORY HABITAT WATER BODY

10641 NTS 09.05.14